

10/19/2000

NOTE TO READER -

The following graphs and table present information that was reported by the Occupational and Residential Exposure Task Force (ORETF) on November 12, 1999 (volumes 8 and 9 of 17). Lawn sizes are reported as a range based on square footage and acreage on a National scale and then by region (North, Transition, South, Mountain, Northwest, and Southwest) that include both US states and Canadian provinces. Sample sizes (n) reported on the graphs are for the number of respondents who knew the size of their lawn. The bars represent the percent of respondents from each region with a particular lawn size. These percentages are different than that reported in the ORETF data because I removed from the calculations the number of respondents who did not know the size of their lawn. If those respondents were included, then the percentage displayed for each lawn size would be less. In other words, the total number of respondents across all regions was 4,103 including those who responded that they did not know the size of their lawn. Of that total, 2,304 (n, as reported on first graph) knew the size of their lawn and that served as the basis for determining the percent of respondents who knew the size of their lawn. The table at the end of the document lists the number of respondents for each geographic region who knew the size of their lawn.

Neil Anderson  
OPP/BEAD  
308-8187

## Size of Lawns - as reported in ORETF Use and Usage Survey/Nat. Gardening Assoc. Survey

Size of Lawn	Region (includes USA and Canada)						
	Total	North	Transition	South	Mountain	Northwest	Southwest
	Percent of Respondents Who Knew Size of Lawn						
< 1000 ft <sup>2</sup>	27.7	40.9	22.7	19.4	5.6	45.3	17.7
1k - 2.5k ft <sup>2</sup>	9.8	6.2	6.7	12.9	26.4	15.1	15.0
2.5k - 5k ft <sup>2</sup>	9.3	9.6	7.2	8.5	31.9	9.3	8.8
5k - 7.5k ft <sup>2</sup>	4.9	4.6	3.6	4.8	--	3.1	23.9
7.5k - 10k ft <sup>2</sup>	2.4	1.6	1.8	2.5	--	5.8	7.1
10k - 15k ft <sup>2</sup>	5.0	0.5	6.0	6.7	12.1	5.3	5.3
15k - 25k ft <sup>2</sup>	14.0	9.8	17.3	17.5	11.0	8.0	10.6
25k ft <sup>2</sup> - 1ac	15.9	11.4	22.1	19.8	4.4	4.0	8.0
1ac - 2ac	5.8	8.2	6.4	4.6	8.8	--	2.7
2ac - 3ac	1.5	1.6	1.8	2.1	--	--	--
3ac - 4ac	0.8	1.8	0.9	--	--	--	--
4ac - 5ac	0.1	--	0.1	0.5	--	--	--
5ac - 6ac	--	0.2	--	--	--	--	--
6ac - 7ac	0.3	--	0.9	--	--	--	--
7ac - 8ac	0.4	--	0.9	0.5	--	--	--
8ac - 9ac	0.2	--	0.3	0.2	--	--	--
> 9ac	1.8	3.9	1.0	0.2	--	4.0	--
Weighted Base of Respondents	2304	563	878	434	91	225	113

-- = Not Available

North = CT, IA, ME, MA, MI, MN, NE, NH, NY, ND, RI, SC, VT, WI; Manitoba, New Brunswick, Nova Scotia, Ontario, Quebec

Transition = AR, DE, DC, IL, IN, KS, KY, MD, MO, NJ, NC, OH, OK, PA, TN, VA, WV

South = AL, FL, GA, LA, MS, SC, TX

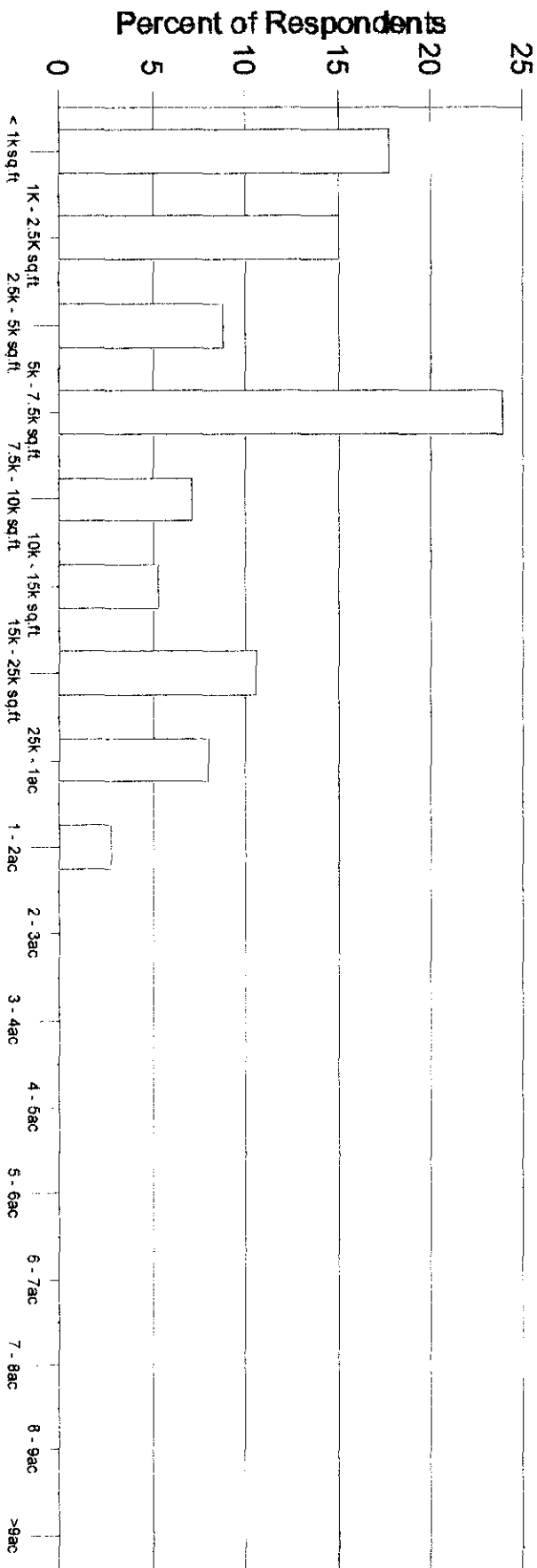
Mountain = CO, ID, MT, UT, WY; Alberta, Saskatchewan

Northwest = OR, WA; British Columbia

Southwest = AZ, CA, NV, NM

# Size of Lawn - Southwest Region\*

ORETF Use and Usage Survey/Nat. Gardening Assoc. Survey



\* Southwest Region = USA: AZ, CA, NV, NM

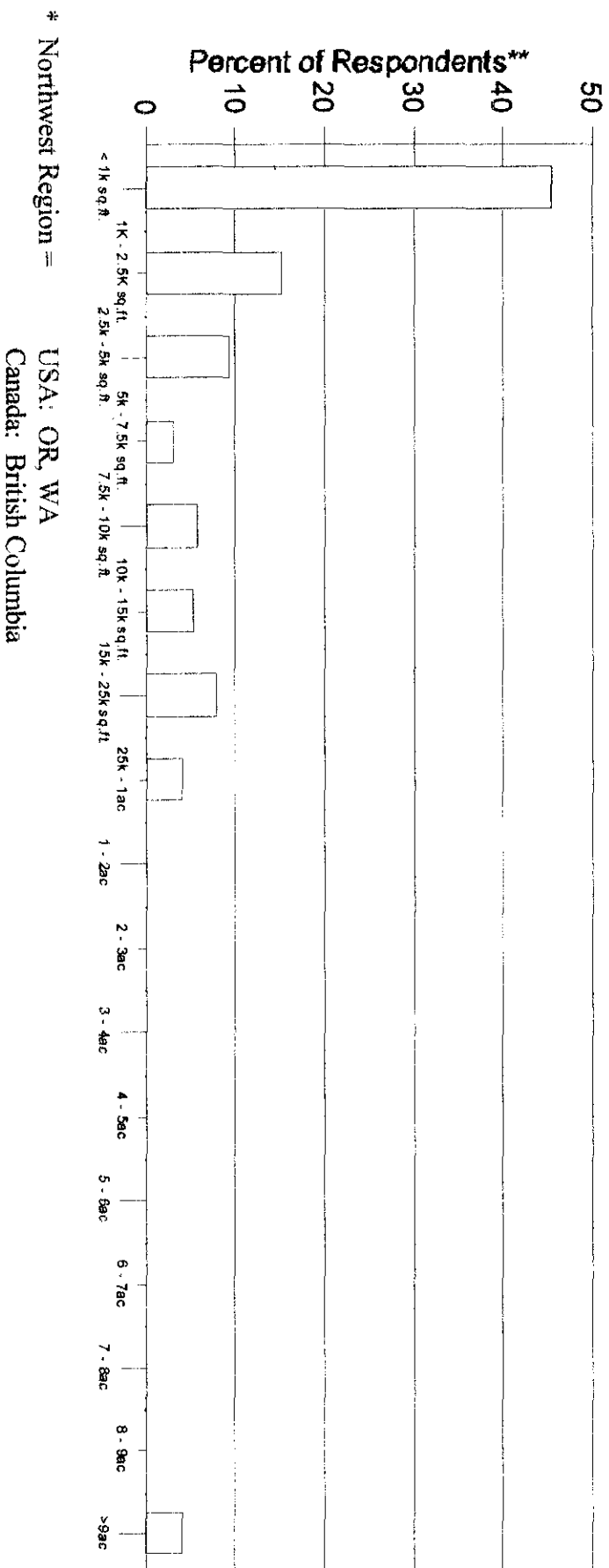
\*\* Percentages based on number of respondents who knew the size of their lawns (n = 113)

42% of respondents had lawns less than 5,000 ft<sup>2</sup>

55% of respondents had lawns between 5,000 ft<sup>2</sup> and 1 acre

# Size of lawn - Northwest Region\*

ORETF Use and Usage Survey/NAT. Gardening Assoc. Survey



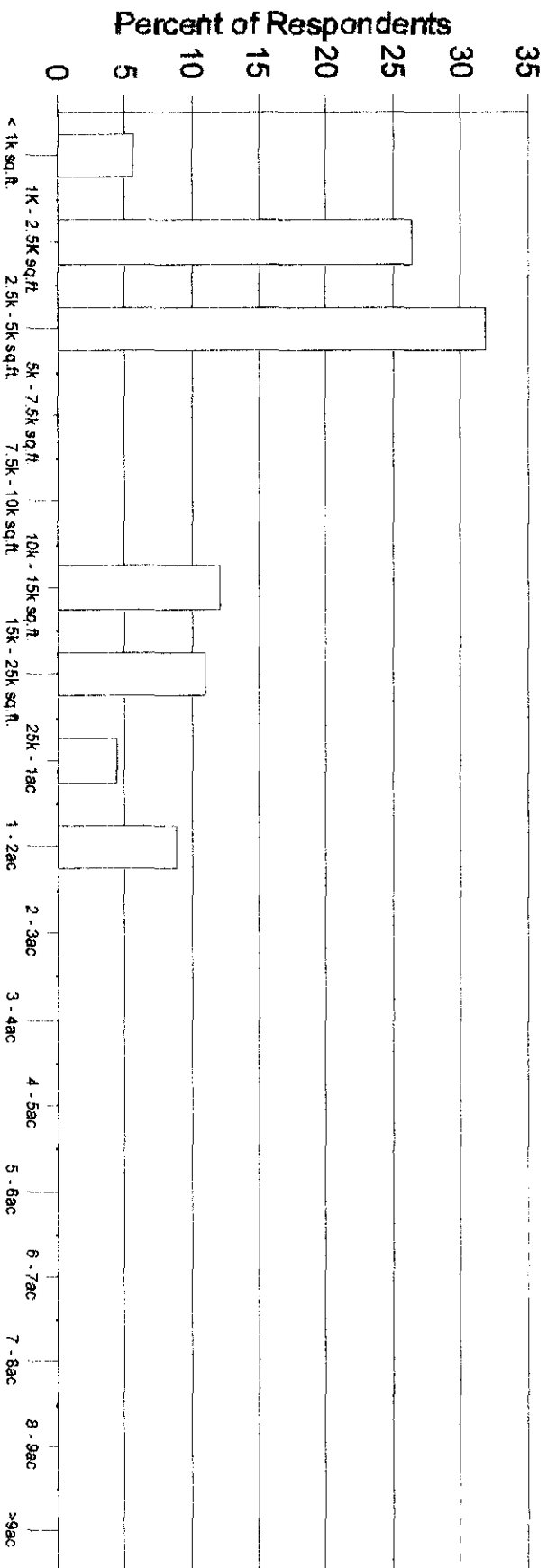
\*\* Percentages based on number of respondents who knew the size of their lawn (n = 225)

70% of respondents had lawns less than 5,000 ft<sup>2</sup>

26% of respondents had lawns between 5,000 ft<sup>2</sup> and 1 acre

# Size of Lawn - Mountain Region\*

ORETF Use and Usage Survey/Nat. Gardening Assoc. Survey



\* Mountain Region = USA: CO, ID, MT, UT, WY

Canada: Alberta, Saskatchewan

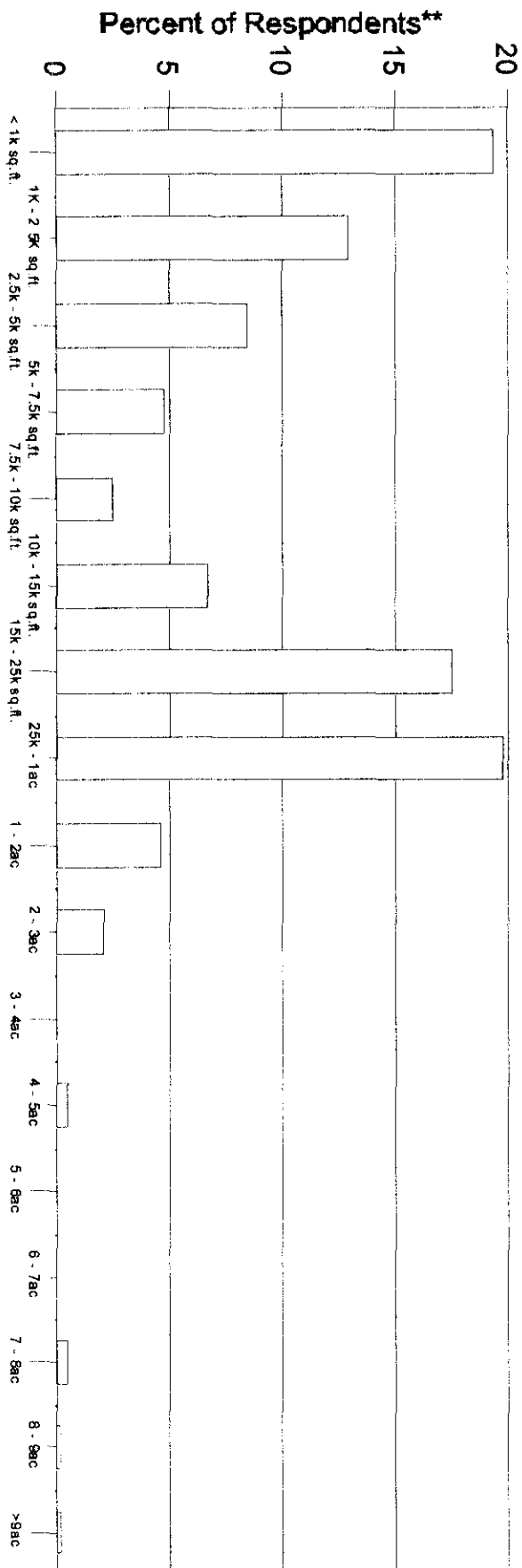
\*\* Percentages based on number of respondents who knew the size of their lawn (n = 91)

64% of respondents had lawns less than 5,000 ft<sup>2</sup>

28% of respondents had lawns between 5,000 ft<sup>2</sup> and 1 acre

# Size of Lawn - South Region\*

ORETF Use and Usage Survey/Nat. Gardening Assoc. Survey



\* South Region = USA: AL, FL, GA, LA, MS, SC, TX

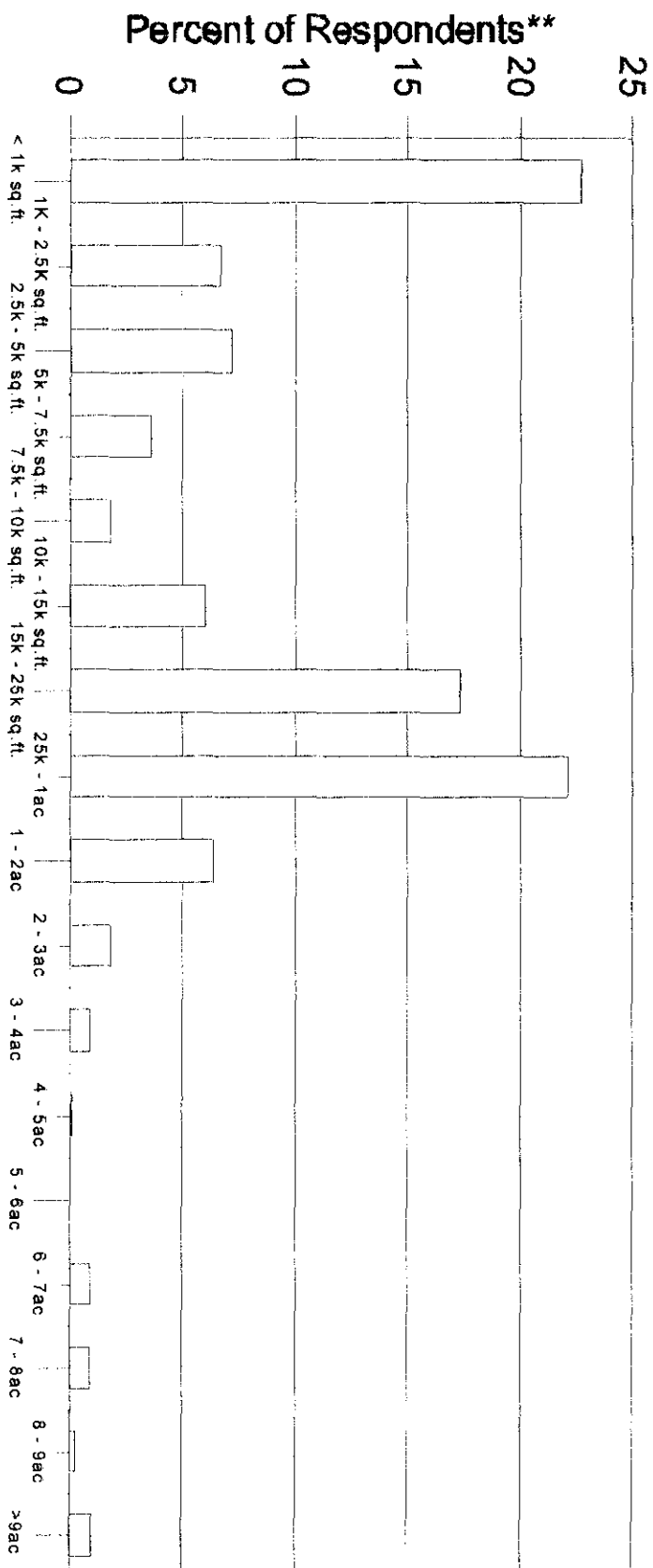
\*\* Percentages based on number of respondents who knew the size of their lawn (n = 434)

41% of respondents had lawns less than 5,000 ft<sup>2</sup>

51% of respondents had lawns between 5,000 ft<sup>2</sup> and 1 acre

# Size of Lawn - Transition Region\*

ORETF Use and Usage Survey/Nat. Gardening Assoc. Survey



\* Transition Region = USA: AR, DE, DC, IL, IN, KS, KY, MD, MO, NJ, NC, OH, OK, PA, TN, VA, WV

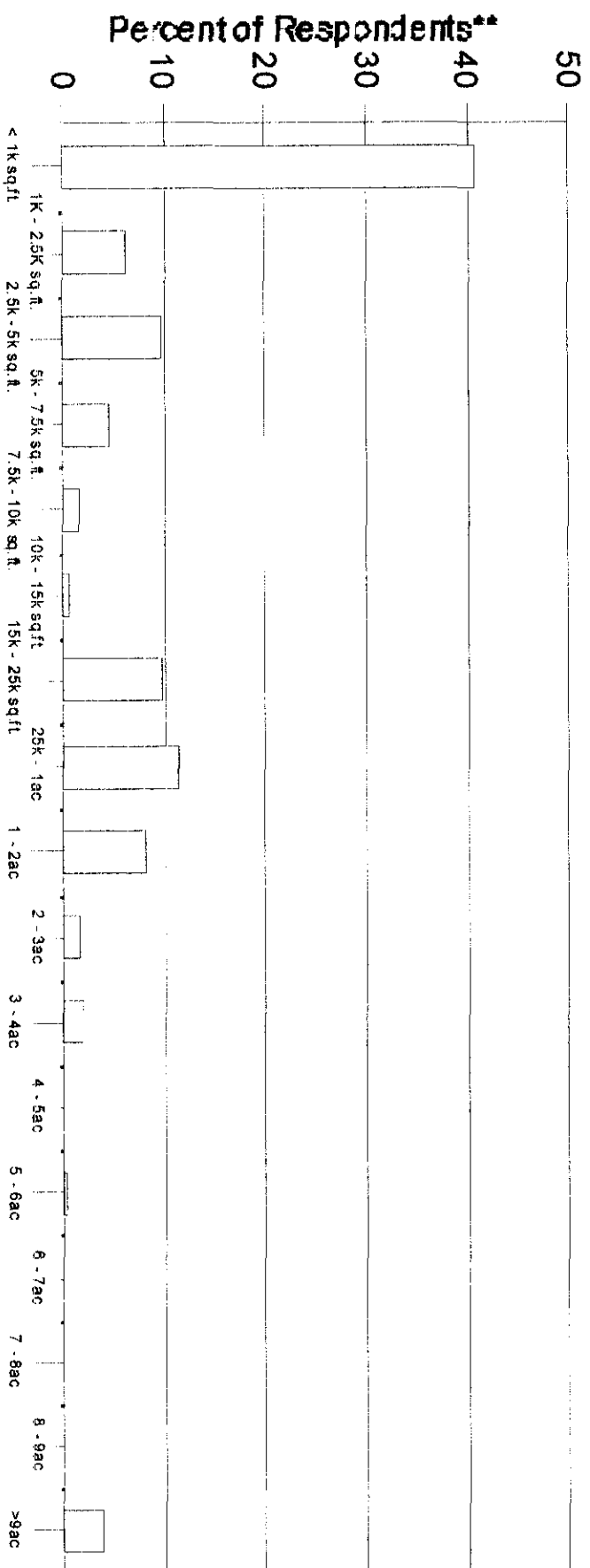
\*\* Percentages based on number of respondents who knew the size of their lawn (n = 878)

37% of respondents had lawns less than 5,000 ft<sup>2</sup>

51% of respondents had lawns between 5,000 ft<sup>2</sup> and 1 acre

# Size of Lawn - North Region\*

## ORETF Use and Usage Survey/Nat. Gardening Assoc. Survey



\* North Region = USA: CT, IA, ME, MA, MI, MN, NE, NH, NY, ND, RI, SD, VT, WI  
Canada: Manitoba, New Brunswick, Nova Scotia, Ontario, Quebec

\*\* Percentages based on number of respondents who knew the size of their lawn (n = 563)

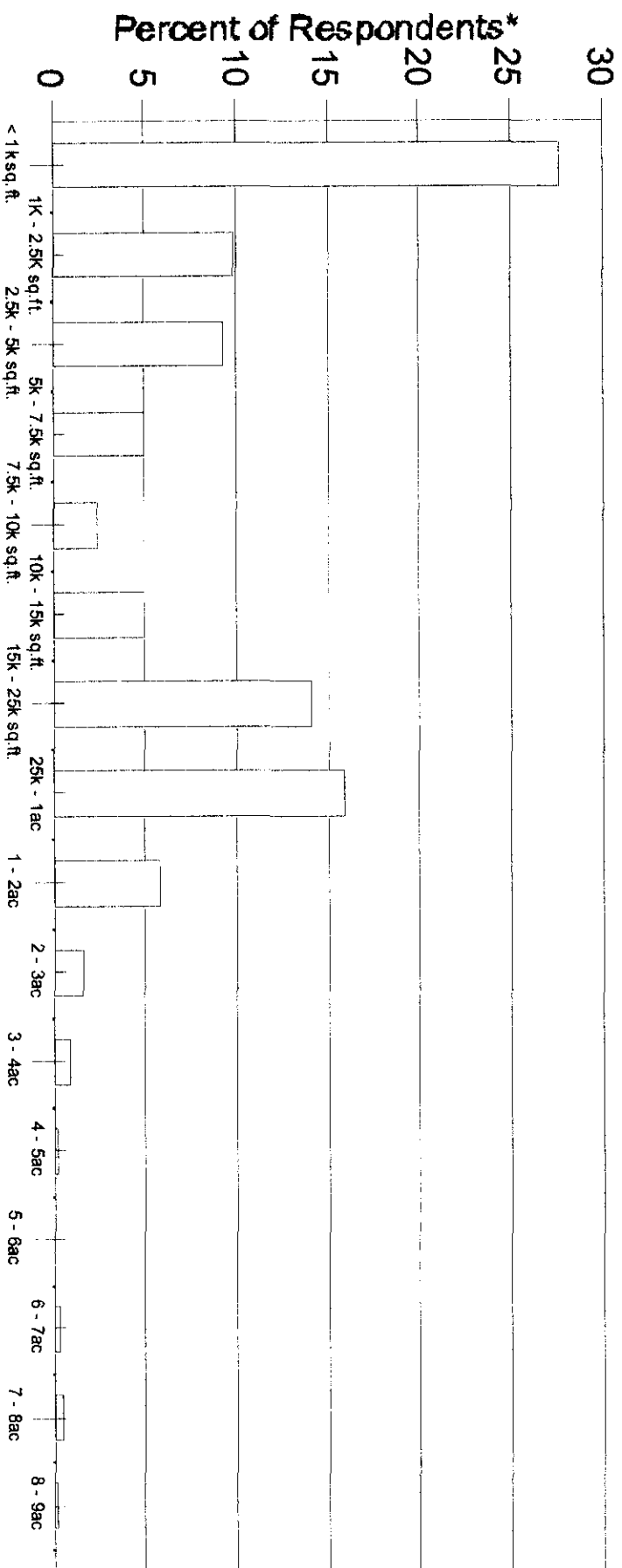
57% of respondents had lawns less than 5,000 ft<sup>2</sup>

28% of respondents had lawns between 5,000 ft<sup>2</sup> and 1 acre



# Size of Lawn - USA and Canada

ORETF Use and Usage Survey/Nat. Gardening Assoc. Survey



\* Percentages based on number of respondents who knew the size of their lawn (n = 2304)

47% of respondents had lawns less than 5,000 ft<sup>2</sup>

42% of respondents had lawns between 5,000 ft<sup>2</sup> and 1 acre

## AGGREGATION OF RESIDENTIAL RISKS FOR DIAZINON

Table 1: Aggregation of Risks for Children

Route of Exposure	Liquid (irrigated) MOE	Granular (irrigated) MOE	Liquid (irrigated) MOE <sup>a</sup>	Granular (irrigated) MOE <sup>a</sup>
Inhalation	509	na	41,000	na <sup>b</sup>
Dermal	378	2,011	22,600	123,000
Nondietary Ingestion				
• Ingestion of grass	39,270	214,000	39,270	214,000
• Hand-to-mouth	2,454	13,393	2,454	13,393
<b>Total Aggregate Risk Index (ARI)</b>	<b>1.11</b>	<b>17.3</b>	<b>18.2</b>	<b>114</b>

<sup>a</sup>Using adjusted dermal and inhalation toxicological endpoints

<sup>b</sup>No air residues detected with granular, watered-in

Required dermal MOE is 100; required inhalation MOE is 300; required oral MOE is 100.

Watering-in required following application.

Watering-in no longer needed to mitigate risks when tox endpoints are adjusted.

Table 2: Aggregation of Risks for Adults

Route of Exposure	Liquid (irrigated) MOE	Granular (irrigated & long pants) MOE	Liquid (irrigated) MOE <sup>b</sup>	Granular (irrigated & long pants) MOE <sup>b</sup>
<b>Application:</b>				
Dermal	361 <sup>a</sup>	800	361 <sup>a</sup>	48,000
Inhalation	na	2,043	na	163,000
<b>Post-application:</b>				
Dermal	632	3,448	37,900	206,000
Inhalation	1,674	na <sup>c</sup>	135,000	na <sup>c</sup>
<b>Total Aggregate Risk Index (ARI)</b>	<b>1.63</b>	<b>3.32</b>	<b>3.5</b>	<b>226</b>

<sup>a</sup>This MOE is based on biomonitoring data compared to the acute oral NOEL of 0.25 mg/kg/day; required MOE is 100.

<sup>b</sup>Using adjusted dermal and inhalation toxicological endpoints.

<sup>c</sup>No air residues detected with granular, watered-in

Required dermal MOE is 100; required inhalation MOE is 300

Watering-in required following application; homeowner must wear long pants during application.

Liquid application restricted to one quart or 5,000 sq ft per day.

Watering-in no longer needed to mitigate risks when tox endpoints are adjusted.

### Diazinon Toxicology Endpoint Selection: Inhalation Exposure

- Critical Study: 21-day inhalation toxicity in rats
- Dose: 0.026 mg/kg/day
- Endpoint: plasma ChE inhibition
- Overly conservative endpoint:
  - Dose/endpoint are based on results of 21-day repeated exposure. Diazinon use pattern exposure scenario is less than 24 hours (factor of 10-fold difference has been shown in NOELs for 28 day vs acute oral dosing) - no adjustment made to dose to account for this
  - Study conditions resulted in chemical deposition to the skin and fur of the animal. Grooming and dermal absorption lead to absorbed dosages approximately 8-fold greater than nose-only inhalation exposures - no adjustment made to dose to account for this
- Adjusted Endpoint:
  - 2.1 mg/kg/day =  
[0.026 mg/kg/day x 8 (whole-body exposure factor) x 10 (acute vs 21-day exposure factor)]

### Diazinon Toxicology Endpoint Selection: Inhalation Exposure

- Adjustment to 21-day whole-body inhalation exposure endpoint
  - 0.026 mg/kg/day is calculated absorbed dose from whole-body inhalation study.
    - incorrectly assumes the entire body burden of the animal is attributable to inhalation exposure and therefore, air concentration values can be used to calculate absorbed dose
    - actual absorbed dose is likely to be approximately 8 times higher than this since test material also enters the body via skin absorption and ingestion during grooming
    - dose needs to be adjusted by an 8-fold factor to accurately reflect absorbed dose in this study
  - 0.026 mg/kg/day is endpoint selected on basis of 21-days of repeated exposure
    - incorrectly assumes that less than 24 hours of exposure at this dose produces equivalent results in animal as 21 days of exposure
    - equivalent acute dose is likely to be 10 times higher than repeated exposure dose
    - dose needs to be adjusted by a 10-fold factor to accurately reflect short-term exposure scenario

### Diazinon Toxicology Endpoint Selection: Dermal Exposure

- Critical Study: 21-day dermal toxicity in rabbits
- Dose: 1 mg/kg/day
- Endpoint: plasma ChE inhibition
- Overly conservative endpoint:
  - Dose/endpoint are based on results of 21-day repeated exposure. Diazinon use pattern exposure scenario is less than 24 hours (factor of 10-fold difference has been shown in NOELs for 28 day vs acute oral dosing) - no adjustment made to dose to account for this
  - Study conditions (e.g. occlusion of dose site, shaving of skin prior to application leading to potential skin irritation) maximize absorbed dose. These conditions unlikely to occur in human exposure scenario
  - Rabbit has highly permeable skin compared to humans (factor of 6-fold more permeable) - no adjustment made to dose to account for this
- Adjusted Endpoint:
  - 60 mg/kg/day =  
 [1 mg/kg/day x 6 (permeability factor) x 10 (acute vs 21-day exposure factor)]

### Diazinon Toxicology Endpoint Selection: Dermal Exposure

- Adjustment to 21-day dermal exposure endpoint
  - 1 mg/kg/day is based on effect in species (rabbit) known to have skin permeability approximately 6 times higher than humans
    - incorrectly assumes skin permeability of human is approximately equivalent to rabbit (available data also indicate that while dermal penetration of diazinon in rabbits is almost 100%, dermal penetration in humans is < 10%)
    - Note: EPA incorrectly assumes that the rabbit is less sensitive to effects of diazinon than other species due to higher levels (~ 7-fold) of serum paraoxonase activity; therefore, the skin permeability factor is balanced out. Data do not support that the rabbit is less sensitive
      - 100 mg/kg/day oral dose to rabbits → 9/22 die, clinical signs observed
      - 100 mg/kg/day oral dose to rats → 0/27 die, no clinical signs observed
    - dose needs to be adjusted by a 6-fold factor to accurately reflect absorbed dose and use in human risk assessment
  - 1 mg/kg/day is endpoint selected on basis of 21-days of repeated exposure
    - incorrectly assumes that less than 24 hours of exposure at this dose produces equivalent results in animal as 21 days of exposure
    - equivalent acute dose is likely to be 10 times higher than repeated exposure dose
    - dose needs to be adjusted by a 10-fold factor to accurately reflect short-term exposure scenario

Table 8 Summary of Dose Estimates and Margin of Exposures for Postapplication Exposures on Treated Turf (Day of Treatment) (MRID 44959101)									
Scenario	Time after Treatmen t	Central Tendency Dose (mg/kg/day)				Central Tendency MOE (Range) (a)			
		Adult		Child		Adult		Child	
Liquid									
Dermal		0.0058 (b)		0.0097 (b)		170 (110-460)		100 (66-270)	
Hand to Mouth		NE		0.00037 (c)		NE		670 (430-1800)	
Turf Mouthing (object to mouth)		NE		0.00187 (d)		NE		130	
Soil Ingestion		NE		0.0002 (e)		NE		1200	
Inhalation (f)	Irrigation Scenario	non-irrig ated	irrigated	non-irrig ated	irrigated	non-irrigat ed	irrigated	non-irriga ted	irrigated
	0-2 hr	0.0001	0.00003	0.00034	0.000096	250 (160-1800)	890 (550-2300)	76 (49-550)	270 (170-710)
	2-4 hr	0.000038	0.000019	0.00012	0.000062	690 (460-2100)	1400 (770-2400)	210 (140-650)	420 (240-730)
	0-4 Hr	0.000071	0.000024	0.00023	0.000079	370 (240-1950)	1100 (820-2300)	110 (73-600)	330 (250-720)
Total Aggregate Risk Index (ARI) (h)								0.17 (0-2 hr inh) 0.3 (2-4 hr inh)	0.33 (0-2 hr in h) 0.38 (2-4 hr inh)
Dermal and Inhalation Aggregate Risk						0.56 (0-2 hr inh) 1 (2-4 hr inh)	1 (0-2 hr inh) 1.24 (2-4 hr inh)	0.2 (0-2 hr inh) 0.42 (2-4 hr inh)	0.48 (0-2 hr in h) 0.59 (2-4 hr inh)
Granular									
Dermal		0.0007 (b)		0.0012 (b)		1400 (1300-1600)		850 (760-960)	
Hand to Mouth		NE		0.00005 (c)		NE		5500 (4900-6300)	
Turf Mouthing (object to mouth)		NE		0.00206 (d)		NE		120	
Soil Ingestion		NE		0.00022 (e)		NE		1100	
Granule Ingestion		NE		0.97 (g)		NE		0.26	
Inhalation (f)	Irrigation Scenario	non-irrig ated	irrigated	non-irrig ated	irrigated	non-irrigat ed	irrigated	non-irriga ted	irrigated
	0-2 hr	0.0000013	0.00001	0.000041	0.000034	2100 (1500-320 0)	2500 (2100-3100)	630 (460-960)	760 (650-960)
	2-4 hr	0.000021	0.00001	0.000068	0.000034	1300 (620-3200)	2500 (2100-3100)	380 (190-960)	760 (650-960)
	0-4 Hr	0.000017	0.00001	0.000054	0.000034	1600 (880-3200)	2500 (2100-3100)	480 (270-960)	760 (650-960)

<b>Total Aggregate Risk Index (ARI) (h)</b>								<b>0.66 (0-2 hr inh) 0.55 (2-4 hr inh)</b>	<b>0.69 (0-2 and 2-4 hr inh)</b>
<b>Dermal and Inhalation Aggregate</b>						4.7 (0-2 hr inh) 3.3 (2-4 hr inh)	5.2 (0-2 and 2-4 hr inh)	1.7 (0-2 hr inh) 1.1 (2-4 hr inh)	2 (0-2 and 2-4 hr inh)

- (a)  $MOE = NOAEL / Exposure$ , where short-term dermal NOAEL is 1 mg/kg/day from a dermal study, the short-term oral NOAEL is 0.25 mg/kg/day from an oral toxicity study and the short-term inhalation NOAEL = 0.026 mg/kg/day from an inhalation study. Values represent an average of all data from the diazinon turf study, the range represents MOEs from the three different locations (CA, GA and PA) for which data are available. **Target MOE = 100 for dermal and oral and 300 for inhalation. Target ARI  $\geq 1$ .**
- (b) Dermal Dose (unabsorbed) (mg/kg/day) =  $TTR (\mu g/cm^2) * TC * 0.001 \text{ mg}/\mu g * 2 \text{ hr/day} / \text{body weight}$ , where adult and child body weights are 70 and 15 kg, respectively, and TC are 14,500 and 5,200  $cm^2/hr$  for adults and children, respectively.
- (c) Hand-to-mouth (mg/kg/day) =  $DFR (\mu g/cm^2) * 20 \text{ events/hour} * 20 \text{ cm}^2/\text{event} * 0.5 (50\% \text{ saliva extraction factor}) * 2 \text{ hour/day} * 0.001 \text{ mg}/\mu g / 15 \text{ kg}$ .
- (d) Turf mouthing (mg/kg/day) =  $DFR (\mu g/cm^2) * 25 \text{ cm}^2/\text{day} * 0.5 (50\% \text{ saliva extraction factor}) * 0.001 \text{ mg}/\mu g / 15 \text{ kg}$ .
- (e) Soil ingestion (mg/kg/day) =  $\text{soil residue } \mu g/g * 100 \text{ mg/day} * 1 \times 10^{-6} \text{ g}/\mu g / 15 \text{ kg}$ .
- (f) Inhalation Dose (mg/kg/day) =  $[\text{air concentration } (\mu g/m^3) * \text{inhalation rate (m}^3/\text{hr)} * 0.001 \text{ mg}/\mu g * 2 \text{ hour}] / \text{body weight of 15 kg or 70 kg}$ . Air concentration is the average across geographic locations. Adult inhalation rate is 1  $m^3/hr$  based on light activities USEPA p. 5-24 Exposure Factors Handbook. Child inhalation rate is 0.7  $m^3/hr$  based on play activities for 3-6 yr old children from Adams 1993, Exposure Factors Handbook pg. 5A-3, which is also the average of 1 hour light activities at 0.5  $m^3/hr$  and 1 hour of moderate activities based on data from Layton 1993, pg. 5-16 for children 3-10 years.
- (g) Ingestion of granules (mg/kg/day) =  $0.3 \text{ g/day} * 0.0484 (\% \text{ ai}) * 1000 \text{ mg/g} / 15 \text{ kg}$ .
- (h) Aggregate Risk index (ARI) = sum of oral, dermal and inhalation exposures, except for granule ingestion which is considered to be episodic for children, and sum of dermal and inhalation for adults. ARI calculated based on both 0-2 hour and 2-4 hour inhalation MOEs.



13544

R119732

**Chemical:** Diazinon

**PC Code:**  
057801

**HED File Code:** 61000 SRRD Other

**Memo Date:** 10/19/2000

**File ID:**

**Accession #:** 412-06-0196

**HED Records Reference Center**  
3/27/2006